STAT 2220 – Contemporary Statistics for Engineers

Time and Location:

Slot 8 (M,W,F 1:30 – 2:20 p.m.)
Room 110 – E2 EITC
CRN: 20129

Instructor:

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Office Hours:

Monday: 11:00 a.m. – 12:00 p.m.
Wednesday: 11:00 a.m. – 12:00 p.m.
Thursday: 10:00 – 11:00 a.m.
(or by appointment)

Calendar Description:
Descriptive statistics, basic probability concepts, special statistical distributions, statistical inference-estimation and hypothesis testing, regression, reliability, statistical process control. Not to be held with STAT 1000, STAT 1001, or 005.100. Prerequisite: a "C" or better in one of MATH 1690 (136.169), the former MATH 1680 (136.168), MATH 1700, MATH 1701 (136.170), MATH 1710 (136.171), or the former 136.173.

Course Objectives:
Upon completion of this course, the student will have an understanding of the fundamental concepts of statistics and an appreciation for the application of statistics in the field of Engineering.

Jump Portal:
All course material (class notes, assignments, practice exams and solutions) will be available to you on the university's JUMP portal (www.umanitoba.ca/jump).

Academic Dishonesty:
Please review the sections in the University of Manitoba General Calendar 2012-2013 dealing with academic dishonesty. In particular, see http://umanitoba.ca/faculties/science/undergrad/resources/webdisciplinedocuments.html

Mark Breakdown:

Lab Quizzes — 10%
First Term Test — 25%
Second Term Test — 25%
Final Exam — 40%

Voluntary Withdrawal:
The voluntary withdrawal date is March 20, 2013. By this time, you will have received your marks for the first term test as well as several quizzes.

Grading Scheme:
There are no predetermined cut-offs for each of the letter grades. However, the following are guarantees to you: A+ (≥ 90), A(≥ 80), B+ (≥ 75), B(≥ 70), C+ (≥ 65), C (≥ 60), D (≥ 50).

Textbook:
There is no textbook for this course. However, I have a few engineering statistics textbooks in my office that you are free to borrow if you wish.

Assignments:
There will be assignments posted on the JUMP portal for each unit of the course. The assignments do not have to be handed in and will not be marked but are primarily for you to apply what you have learned in class. Doing them will help you prepare for the exams and the weekly quiz. Solutions to the assignments will also be posted on the JUMP portal.

Test and Exam:
The midterm tests are tentatively scheduled for **Thursday, February 7** and **Thursday, March 21**, from 1:00 – 2:15 p.m. in a location to be determined. The final exam will be scheduled by student records. All exams will consist of both multiple choice and long-answer questions.

Lab/Tutorial:

Thursday, 1:00 – 2:15 p.m. Room 201 Armes

Tutorials will begin Thursday, January 17. The T.A will go over homework problems and answer students' questions. You will then be given approximately 30 minutes to do a short quiz.

Course Outline:

Unit 1 – Descriptive Statistics

- sample, population, variables, data, distributions
- graphical tools for categorical data (bar charts, pie charts)
- graphical tools for quantitative data (histograms, stemplots, boxplots)
- quantitative measures (mean, median, standard deviation, five-number summary)

Unit 2 – Correlation and Simple Linear Regression

- scatterplots and correlation
- simple linear regression model, least squares regression

Unit 3 – Experimental Design

- experiment vs. observational study
- types of experimental design (completely randomized design, randomized block design, matched pairs design)

Unit 4 – Sampling

- simple random sample, stratified random sample, multistage sample
- sampling bias

Unit 5 – Probability Theory

- sample space, outcomes, events
- probability properties
- mutually exclusive events, independence
- conditional probability
- Law of Total Probability, Bayes' Theorem
- system reliability

Unit 6 – Random Variables

- discrete random variables (probability mass function, cumulative distribution function)

- continuous random variables (probability density function, cumulative distribution function)
- expectation and variance of a random variable
- functions of random variables

Unit 7 – Common Discrete and Continuous Distributions

- discrete uniform distribution
- Bernoulli random variables, binomial distribution
- geometric and negative binomial distributions
- hypergeometric distribution
- Poisson distribution
- continuous uniform distribution
- exponential and gamma distribution (Poisson process)
- normal distribution

Unit 8 – Estimation and Sampling Distributions

- distribution of the sample mean, Central Limit Theorem
- distribution of a sample proportion
- parameters & statistics, point estimators, unbiased statistics

Unit 9 – Inferences on a Population Mean

- confidence intervals (population standard deviation known), sample size determination
- hypothesis testing (population standard deviation known), P-value method, critical value method
- power, Type I and Type II errors
- confidence intervals (population standard deviation unknown)
- hypothesis testing (population standard deviation unknown)

Unit 10 – Other Topics (Time permitting)

- Comparing Two Population Means
- Inferences on a Population Proportion